EXHIBIT 1

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RESEARCH AND DEVELOPMENT DEPARTMENT

PROJECT REPORT

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TITLE: Performance of oxygen scavenging polymer from Chevron

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ABSTRACT:

The experiments carried out show that the oxygen scavenging polymer (OSP) from Chevron is active in removing oxygen, both from air and from water, but there is a lag time before the reaction speeds up. Hydrogenperoxide/UV/heat treatment speeds up the activation.

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performance of oxygen scavenging film from chevron

1. objective

The objective of the work was to evaluate the performance of oxygen scavenging polymer(OSP) from Chevron.

2. experimental

Samples(12 sheets) of OSP was sent to Elopak from Chevron.
All tests was carried out in 200 ml glass jars at room temperature(RT). The area of the film tested was 160 cm^2 (8cmx20cm).

2.1 UV-activation procedure

Figure 1 shows the set up for the UV activation of the films.

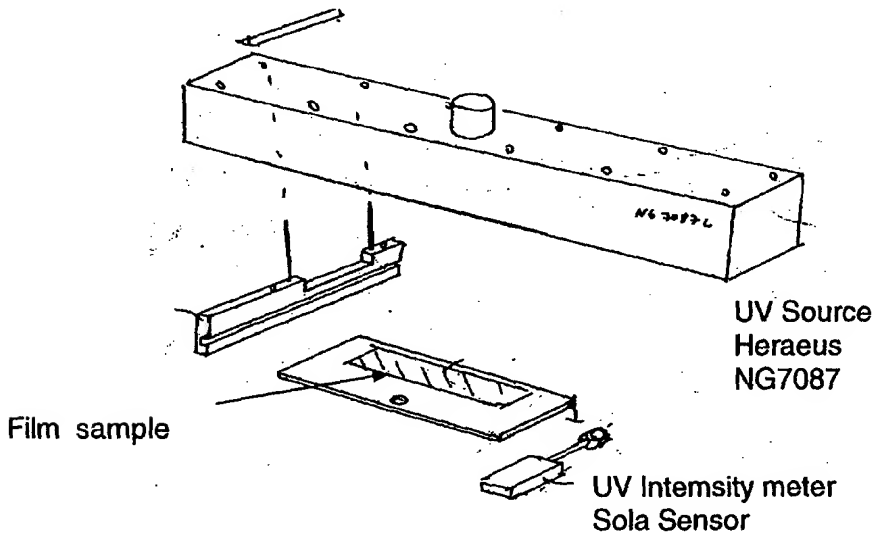

Figure 1 Set up for UV activation

Table 1 show the paramaters for the UV activation.

Table 1 Parameters for UV activation

UV Source	Distance from light source	Exposure time	Dosage*
Heraeus NG7087(λ_{max} 253.7)	2.6 cm	3 seconds	850 mJ/cm^2

*The dosage of the UV light was measured by using a Solascope UV Intensity meter

2.2 removal of headspace oxygen

Test 1

- Activation of film by UV light (850 mJ/cm^2)
- Insert 160 cm^2 OSP film into 210 ml glass jars filled with glass beads(headspace volume 120 ml)
- The lid has a sampling septum for sampling gas samples from the jar.

Analysis of headspace oxygen was performed after 1,2,5 and 7 days by using gaschromatography. The method is described below.

Test 2

- Spraying with 2% H_2O_2 using spray system on aseptic mini rig
- Activation of film by UV light (850 mJ/cm^2)
- Drying of surface by using hot air pistol(surface temperature about 70 °C)
- Insert 160 cm^2 OSP film into 210 ml glass jars filled with glass beads(headspace volume 120 ml)
- The lid has a sampling septum for sampling gas samples from the jar.

Analysis of headspace oxygen was performed after 1,2,3 and 8 days by using gaschromatography. The method is described below.

Analysis of headspace oxygen

0.3 ml gas samples were drawn out by using a gastight syringe (Pressure Lok Series A-2 Gassyringes, Dynatech). The stopvalve was closed and the gas compressed to 0.05 ml. The stop valve is opened and the gas sample is injected into a gas chromatograph, Hewlett Packard HP 5890A to separate O_2 and N_2. The column used was a 30 m x 0.32 mm i.d HP PLOT Molecular Sieve 5A with 12 µm film thickness. The oven temperature was 60 °C and oxygen was detected by a thermal conductivity detector. Argon (99.999%) was used as carrier gas.

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2.3 removal of dissolved oxygen from water

- Activation of film by UV light(850 mJ/cm^2)
- Insert 160 cm^2 OSP film into 210 ml glass jars
- Fill the glass jars with water(saturated with oxygen)

Analysis of dissolved oxygen was performed after 0,1,2,5 and 7 days . The method used is described below.

Analysis of dissolved oxygen

Dissolved oxygen in water was measured by using a Micro O_2 Logger from Orbisphere Laboratories.

2.4 effect of sterilisation methods on film activity

Ethanol sterilisation

- Ethanol sterilsation, a cloth wetted with 70%Ethanol was wiped over the film surface
- Drying of film in a steril bench
- Activation of film by UV light(850 mJ/cm^2)
- Insert 160 cm^2 OSP film into 210 ml glass jars
- Fill the glass jars with water(saturated with oxygen)

Hydrogenperoxide/UV sterilisation

- Spraying with 2% H_2O_2 using spray system on aseptic mini rig
- Activation of film by UV light (850 mJ/cm^2)
- Drying of surface by using hot air pistol(surface temperature about 70 °C)
- Insert 160 cm^2 OSP film into 210 ml glass jars
- Fill the glass jars with water(saturated with oxygen)

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3. results and discussion

3.1 removal of headspace oxygen

Figure 2 show the amount of removed oxygen from air. There was a difference between the two parallels in the experiment with peroxide/UV/heat treatment, but it seems that the headspace oxygen removing activity is enhanced by peroxide/UV/heat treatment. An OSP film with area of 160 cm^2 has capacity of removing about 18-20ml oxygen.

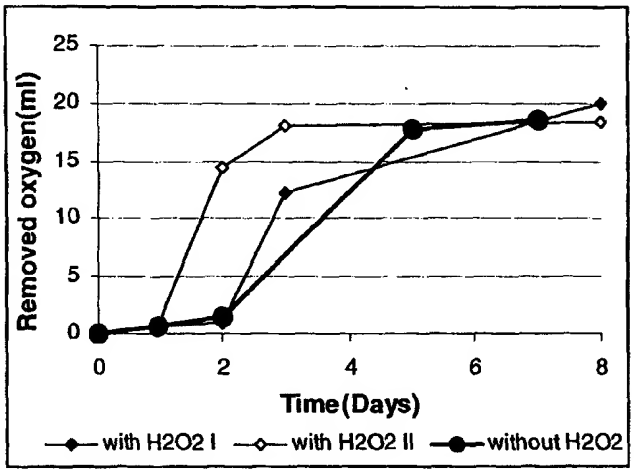

Figure 1 Removal of headspace oxygen by OSP

3.2 removal of dissolved oxygen from water

Figure 3 shows the amount of removed dissolved oxygen from water. Here we can see the same trend as for the headspace experiments, the peroxide/UV/heat treatment speed up the activation. The ethanol sterilisation does not appear to have a necative effect on the activity of the OSP film.

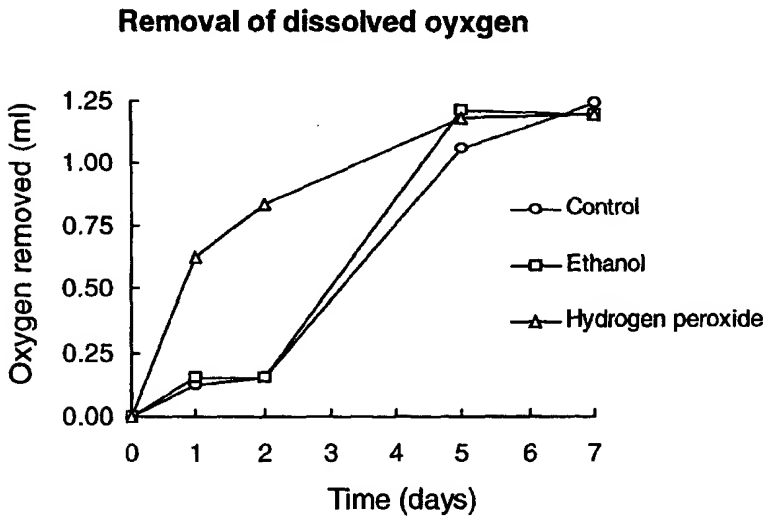

Figure 3 Removal of dissolved oxygen from water by OSP

4. conclusion

The experiments carried out show that the oxygen scavenging polymer (OSP) from Chevron is active in removing oxygen, both from air and from water, but there is a lag time before the reaction speeds up. Hydrogenperoxide/UV/heat treatment speeds up the activation.